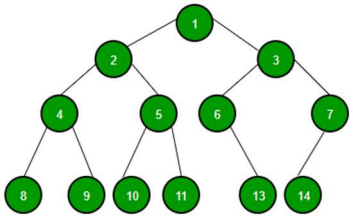
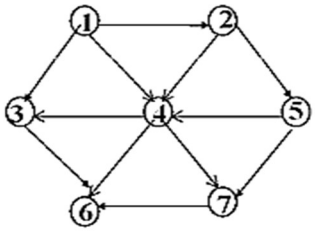
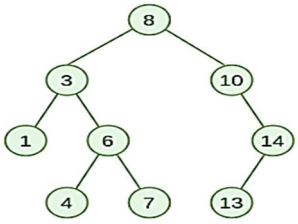
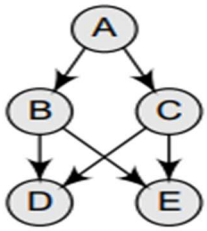
Shiv Nadar University Chennai

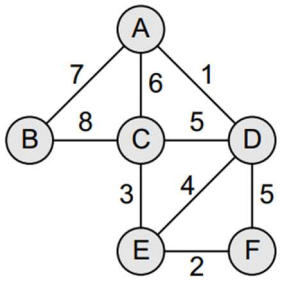
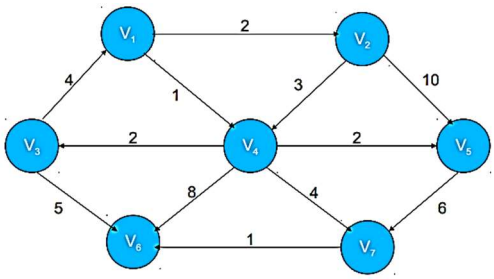
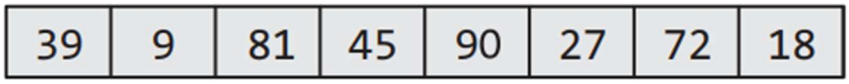
End Semester Examinations, 2022-2023 Even

Question Paper

Name of the Program: Common to B.Tech. AI & DS and B.Tech. CSE (Cyber Security)		Semester: II
Course Code & Name: **CS1006T DATA STRUCTURES**		
Regulation 2021		
Time: 3 Hours		Maximum: 100 Marks

Q.No		Questions	Marks	CO#	KL#
Part A – Answer all the Questions (10×2= 20 Marks)					
1		Consider the balancing parenthesis application of stack. What is the maximum number of parentheses that will appear on stack at any instance of time during the analysis of (( ) (( )) (( )))?	2	CO2	KL3
2		For the given tree, calculate the height and depth from the root level. 	2	CO3	KL2
3		List down a few real-life applications of graph ADT.	2	CO3	KL2
4		For the given graph, represent the adjacency matrix and adjacency list. 	2	CO3	KL2
5		Mention the scenarios which demand single & double rotation in AVL trees.	2	CO3	KL2
6		Given a height *'h'*, compute the minimum and maximum number of nodes in a complete binary tree.	2	CO3	KL2
7		Identify the traversal technique that produces sorted output for the given graph, 	2	CO3	KL3
8		For the given list of elements, 10, 20, 35, 48, 59, 82, 96, 105 assume the element 96 to be searched. Count the number of comparisons that will be made using binary search?	2	CO4	KL3
9		Differentiate internal and external sorting.	2	CO4	KL2
10		What do you mean by Collision? How can you handle it?	2	CO5	KL1

Part B – Answer any 5 questions (5×16= 80 Marks)					
11	a	For the given sequence, write down the increasing order of asymptotic notations by assuming a large value for *n*, $O(n^n)$, $O(\log n)$ $O(1)$, $O(n^3)$, $O(\log(\log n))$, $O(n \log n)$, $O(n!)$, $O(2^n)$	4	CO1	KL2
	b	List down the various classes of asymptotic analysis of algorithms with an example for each.	4	CO1	KL1
	c	Consider the following function. Analyze the logic and deduce the best case, worst case and average case running time. *func (arr[], x, low, high)* *repeat till low = high* *mid = (low + high)/2* *if (x = arr[mid])* *return mid* *else if (x > arr[mid])* *low = mid + 1* *else* *high = mid – 1*	8	CO1	KL2
12	a	Tabulate the differences between circular queue, double ended queue, and priority queue with graphical representations.	6	CO2	KL2
	b	An application helps a user to navigate in both directions. When the user starts with the first page, the navigation buttons are disabled. Further, when the user launches the 2nd page, the back button is enabled and so forth. Finally, if the user is in last page, forward button will be disabled. Identify the data structure that can perform this sort of application, explain the possible operations that can be performed using this data structure in detail.	10	CO2	KL3
13	a	Consider the given sequence of elements: 63, 9 ,19, 27, 18, 108, 99, 81. Construct the following trees by performing insertion operation: (a) BST (b) AVL (c) Min heap (d) Max heap	16	CO3	KL3
14	a	Consider the following graph. Identify its type and determine whether topological sorting can be applied or not. Write the final ordering of the vertices if topological sorting is applicable. 	10	CO3	KL3
	b	Write the algorithm and construct an expression tree for the input *ab+cde+***	6	CO3	KL3

15	a	For the given graph, perform the following:  (a) Construct the minimum spanning tree using Prim's algorithm assuming the start vertex as *A*. (b) Construct the minimum spanning tree by applying Kruskal's algorithm.	16	CO3	KL3
16	a	Find the single source shortest path for the given graph by assuming V_1 as the starting vertex. Showcase the table status for every vertex to be visited.  	16	CO3	KL3
17	a	Explain the concept of divide and conquer strategy and discuss how it can be implemented in merge sort. For the given sequence, explain the stepwise progress of divide and conquer approach that merge sort implements.  	16	CO4	KL3
18	a	Given the input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function *h(x)=x % 10*, implement and show the following: i. Separate chaining hash table ii. Hash table using linear probing iii. Hash table using quadratic probing iv. Hash table with second hash function *h2(x)=R− (x % R)* with *R* value to be chosen appropriately.	16	CO5	KL3

KL – Bloom's Taxonomy Levels
(KL1: Remembering, KL2: Understanding, KL3: Applying, KL4: Analyzing, KL5: Evaluating, KL6: Creating)
CO – Course Outcomes
